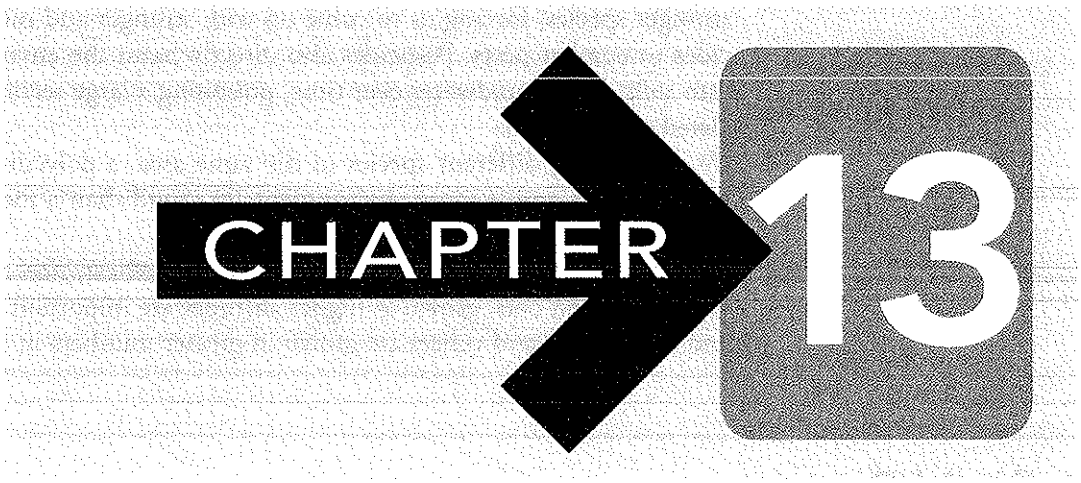


Forestry and Rangelands

IN THIS CHAPTER

Summary: One of the Earth's wonders is its diversity of plant life, including ancient forests. Although forests are complex ecosystems in themselves, they are also divided according to climate. Deforestation and poor land practices often lead to overgrazing and desertification.

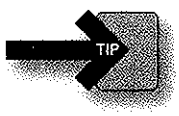
Keywords

- Old-growth forest, deforestation, overgrazing, desertification, extinct, relict species, degradation, tree plantations, forest fires, forest/rangeland management

Forests

Forests and woodlands cover nearly 30% of the global land surface. Most of this area is known as *closed canopy* (tree crowns cover over 20% of the ground below). The rest is *open canopy* with less than 20% ground coverage.

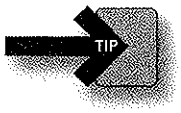
Forests are mainly divided into *temperate* (moderate climate) or *tropical* regions. Temperate forests are grouped into *conifers* (needle-leaf trees) like pine, spruce, redwood, cedar, fir, sequoia, and hemlock, while tropical forests contain flat-leaf trees. Old-growth forests contain mostly conifers. Second- and third-growth forests contain trees of the same age and size as some of the younger old-growth forests, but have far fewer plant and animal species.



Temperature and rainfall are the major determinants of forest type, including temperate rain forest, tropical dry forest, and tropical rain forest. A *temperate rain forest* is found in only a few special places around the world, such as the Pacific temperate rain forest on the west coast of North America. These temperate forests are often dominated by conifer trees adapted to wet climates and cool temperatures.

Located near the equator, a *tropical dry forest* has distinct rainy and dry seasons. Most tropical dry forest plants have adapted to withstand high temperatures and seasonal droughts.

The third major forest type receives and contains a lot of moisture. A *tropical rain forest,* also found near the equator, harbors the richest diversity of terrestrial plant and animal species. Though hot and humid, these forests often get less than half the rainfall of a "rain" forest and have a more open canopy with less dense undergrowth.



Today, the largest and most severe species loss is taking place in the tropical rain forests near the equator. Trees are cleared for grazing, farming, timber, and fuel. Ecologists have found that over 50% of the the Earth's original rainforests, since prehistoric times, have been cleared. At current rates, the remaining forests are being lost by around 1.8% per year.

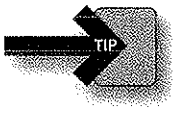
Old-Growth Forests

Old-growth forests are found primarily in northern climates, although there are small caches of untouched trees in remote locations like Tasmania.

Old-growth forests are made up of trees that are often several thousand years old and take at least 100 years to regrow to maturity if cleared.

Old-growth forests are those that have never been harvested. They contain a variety of trees between 200 and 2,000 years old. Forest floor leaf litter and fallen logs provide habitat for a complex interdependent mix of animals, birds, amphibians, insects, bacteria, and fungi, which have adapted to each other over geological time. When forests are cleared, the plants, animals, birds, and insects living under their protective cover are displaced or destroyed as well. Genetic uniqueness (biodiversity) of these affected species is permanently lost.

Redwood National Park and three California state parks contain some of the world's tallest trees: old-growth, coastal redwoods. Living to be as much as 2,000 years old, they grow to over 91 meters tall (nearly 300 ft). Other species such as spruce, hemlock, Douglas fir, and sword ferns create a multilevel tree canopy towering above the forest floor.



Redwoods are long lived because they are particularly resistant to insects and fire. Scientists discovered giant redwoods contain high levels of bark tannins protecting them from disease. Additionally, redwoods can grow from seeds or new sprouts from a fallen tree's root system, stumps, or burls. So clearing of fallen trees reduces new growth.

The most important factor in redwood survival is their biodiversity. Forest floor soils play a big role in tree growth. A healthy redwood forest includes a variety of tree species, as well as ferns, mosses, and mushrooms. These are important to soil regeneration. Fog from the nearby Pacific provides cooling and moisture for the trees.

The Redwoods, however, have lost a lot of ground. Of the original 1,950,00 acres of redwood forests growing in California, only 86,000 acres remain today. Three percent of these acres are preserved in public lands and 1% is privately owned and managed.

It comes as no surprise that when trees are reduced through overcutting, biodiversity drops. When forests or grasslands are cleared and planted as a single cash or food crop, the number of species drops to one, plus a few weeds. But this is only part of the problem. Since forests support animal species with food and shelter, these species are also eliminated. Often, new species replace the originals, but generally the total number of species declines. When plant cover is removed, other neighboring populations (mammals, birds, and insects) are greatly affected.

If a species can't find new habitat or adapt to changed land use, it often becomes *extinct.* Its unique genetic information and position in the ecosystem are forever lost.

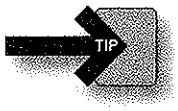
A species that has survived, while other similar ones have gone extinct, is called a *relict species.* A relict species, like the European white elm tree in western Siberia, may have had a wider range originally but is now found only in specific areas. Other relict species, like horseshoe crabs or cockroaches, have survived unchanged since prehistoric times, even as other species become extinct.

Deforestation

From the time when early peoples switched from being hunters and gatherers to settling down and growing crops, humans have had more and more impact upon the land. The clearing of trees to grow food crops is so common that there are few original forested areas still untouched.

Farmers in the infant United States cleared the land and put it to the plow. The timber was used to build homes, farm buildings, and fences. Cleared areas around a wooded farm provided safety from forest predators such as bears, wolves, and cougars.

Gradually, landowners realized some methods of timber harvesting were far better than others. This became noticeable when cleared land, once rich in nutrients, grew poorer and poorer for raising crops and began to erode in locations continually exposed to wind and water.

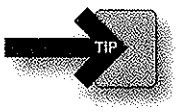


Fuel wood and charcoal are another major human requirement, especially in developing countries. It has been estimated that over 1.5 billion people currently depend on fuel wood as their main fuel source. By 2025, as the global population increases, fuel wood demand is estimated to become twice the available supply.

Fortunately, Asian deforestation has slowed from 8% in the 1980s to less than 1% today. The number of protected areas has also increased over the past 20 years, from around 2.6 million km^2 to about 12.2 million km^2.

Deforestation is the large-scale destruction of trees in an area by disease, cutting, burning, flooding, erosion, pollution, or volcanic activity.

Large lumber companies must be economically successful or they go out of business. They have to get as much timber from the land as possible to meet growing needs for wood, paper, and other products. As with all industries, there are good players and bad players. Good players work with scientists to plant and maintain this renewable resource. Others grab what they can and don't consider the long term.



When a forested area is cut down completely without a tree left standing, it is known as *clear-cutting.* In the United States and Canada, lumber and pulpwood is most often harvested using this method. Clear-cutting is more economical than selective cutting since it allows the use of large machines to fell, trim, and truck logs much faster. However, the major drawbacks to clearing a wooded area are that it completely wastes small trees, invites erosion, and destroys habitat for other species.

Clear-cutting performed in small scattered areas, individual rows, or alternating strips has less overall impact and more potential for faster regeneration than huge deforested areas encompassing thousands of acres. As in real estate, the location and geography of a clear-cut area are important. Clear-cutting a steep slope will cause much more erosion than clear-cutting a flat area. In addition to stripping the land of soil and nutrients, clear-cutting allows soil runoff to fill streams and kill aquatic life.

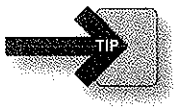
In *selective cutting,* only a small percentage of mature trees are cut every 10 to 20 years. Ponderosa pines, for example, are selectively thinned to improve the growth of remaining trees.

Leaving mature trees standing keeps them as a seed source for new tree growth in a cleared area and provides forest habitat.

Industrial timber is used for lumber, plywood, veneer, particleboard, and chipboard. These products make up about half of the world's use of timber. International timber trade amounts to over $100 billion per year, with developed countries producing less than half the timber total, but using about 80% of the available timber. Canada, Russia, and the United States are the largest producers of industrial wood and paper pulp, but much of North American logging is done in managed forests where downed trees are replaced with new seedlings.

Forest Management

Of the world's forests, around 25% is managed for wood output. Sustainable harvests are key, and special attention is paid to insect, disease, and fire impacts.



It has been estimated that over 50% of all the Earth's forests have been converted to cropland. The remaining 3.8 billion hectares of forest and woodland cover about 29% of the land. Although most countries cut down more trees than they replant, China and Japan have developed huge reforestation programs. Japan has increased its forests to nearly 68% of its land area, and imports the majority of its wood needs from its trading partners.

Government forest management is controversial since lumber companies, ecologists, landowners, developers, and fishermen have different opinions on how forest areas should be used and what access should be allowed. Lumber and jobs come into the equation, as well as public demand for forests to offer wilderness hiking, camping, and wildlife habitat. Policy changes have opened public lands to more logging, mining, oil and gas drilling, and motor vehicles.

Tree Plantations

Reforestation projects involve large plantings of a single species like eucalyptus or pines. Although one-species planting makes it easier for mechanical harvesting, it also invites insect and disease devastation. Monoculture tree planting decreases the strength found in a diverse natural or planted forest. A species-specific disease isn't able to wipe out an entire area planted with different kinds of trees.

Tree planting is not just a commercial trend. Communities are planting vacant lots and roadways with fruit and nut trees, as well as fast-growing trees that enrich the soil, curb erosion, and serve as wind breaks.

Forest Fires

In the 1930s, hundreds of millions of hectares were destroyed by fire that leveled entire towns and killed hundreds of people. Public outcry demanded the U.S. Forestry Service do something. So a policy of extinguishing fires as quickly as possible was enacted. An advertising campaign featuring Smokey the Bear warned that "only *you* can prevent forest fires." People were educated about carelessness with campfires and not to toss lit cigarettes from cars.

Unfortunately, only part of the picture was addressed. Some biological species need fire to reproduce because a forest fire clears undergrowth allowing new sprouts to survive. Also, when a lot of forest debris gathers, it increases rather than decreases the chance of large, more devastating wildfires.

In 2002, the federal government spent $1.6 billion to fight wildfires, or around $200 per hectare. Controlled burns and preburns, besides making forests less fire-prone and removing dead wood and debris, cost taxpayers only about 50 cents per hectare. The key is to monitor natural fires and use scientific methods of control to gain their benefits.

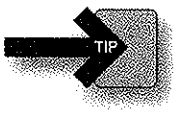
Rangelands

Trees are important for many reasons, but grasslands are another big biome. Composed of savannas, steppes, prairies, open woodlands, and a variety of grasslands, rangelands cover around 25% of the planet's land surface. Much of North America's Great Plains (e.g., 3.8 billion hectares) is grassland. Another 4 billion hectares of other lands (i.e., tundra, marsh, scrub brush, forest, and desert) support approximately 3 billion cattle, goats, sheep, buffalo, and camels that humans use for nutrition. The key is to balance sustainable herding and grassland biodiversity.

Unfortunately, grassland biomes are often converted to cropland or urban areas. In fact, annual grassland conversion is three times that of tropical forests worldwide. The U.S. Department of Agriculture cites more threatened plant species in rangeland than in any other biome.

Rangeland Management

Careful monitoring and moving of grazing animals by ranchers and *pastoralists* (i.e., herders) plays a big role in rangeland management. Rainfall, alternate and seasonal plantings, varied forage, and natural fertilization methods all help maintain range quality.



Rangelands in the United States are often overgrazed due to political and economic pressures. The Natural Resources Defense Council reports that 30% of public rangelands are in fair condition, while 55% are in poor to very poor condition. Although regulations exist to protect rangeland, poor enforcement and limited funds augment overgrazing. Decreasing native forage, invasive nonnative species, and higher erosion are added factors.

Grazing

Range specialists have found that brief (a day or two), intense, *rotational grazing* like that done by wild herds (e.g., buffalo, zebras) is often better for the land than long-term grazing. A herd confined to a small area eats everything, not just the tender shoots, tramples woody plants and weeds, and fertilizes heavily before moving to greener pastures. The herd's impact and subsequent fertilizer application provide rangeland with needed nutrients, while competing weeds are eliminated.

Raising wild species (e.g., impala, red deer) also supports grazing sustainability. Wild species are often more pest resistant, disease resistant, and drought tolerant, and can fend off predators better than domestic cattle, goats, or sheep. In the United States, modern ranchers note that elk, American bison, and various African species need less care and feeding than cattle or sheep and bring a better market price.

Deserts

Most people think of *deserts* as uninhabitable and devoid of life. These barren stretches are probably the last place on Earth most people would choose to visit or live. Baking daytime temperatures up to 57°C, and cold nights, down to 5–10°C, take people by surprise. Extreme heat and dryness, interrupted by unpredictable flash floods, give places like Death Valley and The Desert of No Return (the Taklimakan Desert in northwest China) their names. In fact, the Antara desert in Chile has spots that only receive rain a few times a century, and some areas have never had rain.

Deserts cover roughly 30% of the Earth's surface. Most deserts, like the Sahara in North Africa and the deserts of the southwestern United States, Mexico, and Australia, are found at low latitudes. Cold deserts are mostly found in the basin and range area of

Table 13.1 The world's major deserts cover a lot of area around the globe.

DESERT	LOCATION	APPROXIMATE AREA (km^2)
Sahara	North Africa	9,065,000
Arabia	Saudi Arabia	2,240,000
Gobi	China	1,295,000
Kalahari	Southern Africa	582,000
Chihuahuan	North central Mexico, southwestern United States (Arizona, New Mexico, Texas)	455,000
Great Basin	United States (Idaho, Oregon, Nevada, Utah)	411,000
Great Victoria	Australia	338,500
Patagonia	Peru, Chile	150,000

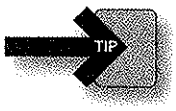
Utah and Nevada and in sections of western Asia. Table 13.1 lists the locations and areas of several of the world's largest deserts.

The common misconception that the desert is a lifeless landscape is really an illusion. Deserts have abundant and unique plant life, as well as unique animals. Soils often contain many nutrients just waiting for water, so that plants can spring to life when it rains. Fires provide a carbon source (ash), and flash flooding mixes everything up to mineralize desert soils.

The dual problems of storing water and finding shelter from the sun's blistering heat and the night's cold make deserts an environment with few large animals. Snakes and lizards are dominant creatures of warm deserts. Only small mammals, like the kangaroo rat of North America, are found in any great number.

Types of Deserts

In 1953, Peveril Meigs divided the Earth's desert regions into three categories (*extremely arid, arid,* and *semiarid*) according to their annual rainfall. In Meigs' system, extremely dry lands can go over a year without rain. Arid lands have less than $\frac{1}{4}$ cm of rainfall yearly, and semiarid lands have a mean rainfall of between $\frac{1}{4}$ and $\frac{1}{2}$ cm. Arid and extremely arid lands are called deserts, while semiarid grasslands are known as *steppes.*



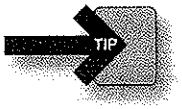
While deserts can be classified in different ways, most deserts are distinguished by the following factors:

- Total rainfall
- Number of days of rainfall
- Temperature
- Humidity
- Location
- Wind

Deserts are not limited by latitude, longitude, or elevation. They are found everywhere from the poles to the equator. The People's Republic of China has the highest desert, the Qaidam Depression (2,600 meters above sea level), and one of the lowest deserts, the Turpan Depression (150 meters below sea level).

Desertification

Deserts are formed from a variety of geological and natural factors. Global temperatures, rainfall rates, and tectonic processes all contribute. *Desertification* is the downgrading of rich soil and land into dry, barren lands. Today desertification takes place because of damaging human activities and climatic changes.



Desertification occurs because dry land environments are vulnerable to overdevelopment and poor land use. The following factors all increase desertification:

- Poverty
- Political instability
- Deforestation
- Overgrazing
- Rain runoff
- Changing wind patterns driving away rain clouds
- Bad irrigation practices

Estimated calculations indicate over 250 million people worldwide are directly harmed by desertification. Moreover, it is thought that as much as one billion people in nearly 100 countries are at risk. These populations are poor and have few resources to stem the desertification problem.

Degradation of Dry Lands

When formerly fertile land is degraded, there is a loss of biodiversity. As a result, the economic yield and complexity of cropland, pasture, and woodland is damaged. *Degradation* is due mainly to climate changeability and unsound human activities, like overgrazing and deforestation. While drought is often linked with land degradation, it is a natural event. It happens when there is much less than normal rainfall in a region over an extended period of time.

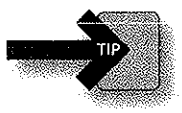
Rainfall

Deserts have little if any freshwater supplies. In desertification, rainfall varies seasonally during the year, with wide swings happening over years and decades, leading to drought. Over time, desert ecology adjusts to this moisture fluctuation.

The biological and economic resources of dry lands, like soil quality, water supplies, plants, and crops, are easily damaged. For centuries, native people have protected these resources with time-tested methods like *crop rotation* and nomadic herding.

Unfortunately, in recent decades rising populations and deteriorating economic and political conditions have contributed to poor land practices. Also, when people don't take climate and soil conditions into account and respond accordingly, desertification is the result.

Land Overuse



Land overuse can come from economic circumstances, poor land laws, or cultural customs. Some people exploit land resources for their own gain with little thought for the land or neighboring areas. Some people in poverty have little choice but to overuse the meager resources available to them, even to the extent of wearing out the land.

Trade and exploitation of a country's natural resources often leaves land restoration in the hands of local people with little or no funding. In the same way, an economy based on the sale of crops can force farmers to ignore the land's overexploitation.

Refugees and other displaced people damage rich land during wars and national emergencies. Natural disasters like floods and droughts do the same thing.

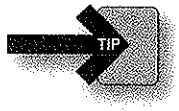
Population Density

Most people blame desertification on overpopulation. However, large populations practicing good conservation and land management can avoid desertification. It is said the United States could feed most of the world with grain produced and stored in the midwestern grain belt.

Desertification is a complex problem, and the relationship between population and desertification is not clear. Sometimes population decreases cause desertification, since there are fewer people to take care of the land. In some countries when young villagers go to the city to find work, their aging parents can't keep up with the cultivation needs of the land.

Soil and Vegetation

When topsoil is blown away by the wind or washed away by rainfall, the physical structure and biochemistry of the land is changed. Surface cracks appear and nutrients are lost. If the water table rises from poor drainage and irrigation methods, the soil is saturated and salts increase. When cattle trample soil, it's harder for plants to grow in the compressed soil and the soil erodes.



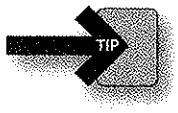
Less plant growth is both a result and cause of desertification. Loose soil damages plants, buries them, or exposes their roots. Disturbed land also increases downstream flooding, poor water quality, river and lake sedimentation, and silt buildup in reservoirs and navigation channels. It can cause dust storms and air pollution, damaging machinery and reducing visibility. Wind-blown dust increases public health problems, including allergies, eye infections, and upper respiratory problems.

Economics

More and more people and governments are seeing the link between desertification, displaced people, and military conflicts. In the past 30 years, many African people have relocated or been forced to move to other countries because of war, drought, and land degradation. Environmental resources in and around cities and refugee camps, where these people settled, came under severe pressure. Difficult living conditions and the loss of cultural identity further undermined social stability.

Little economic data on losses resulting from desertification exist, but it is thought the depletion of natural resources in some countries is as high as 20% of their annual gross domestic product (GDP).

Trends



Soil loss, low moisture, and high temperatures are all factors in desertification studies. Researchers in Brazil, Namibia, South Africa, the southwestern United States, and northern Mexico are all actively examining land degradation and sand movement. Large global deserts are also monitored for geological mineral mapping and the determination of the active sand transport corridors.

Remote Sensing

In the past 70 years, the use of remote sensing has been an important tool in the study of dynamic desert features, like dunes. The ability to study changes over time allows analysis of current climatic systems and marginal land areas at risk for future desertification.

Remote sensing helps geologists inspect an entire desert system over different time periods. It provides a way to project past activity and monitor current climate changes. Drought-prone areas on the margins of wind pathways and sand seas are prone to dune advance and encroaching desertification. Human activity in these regions must also be examined for climatic impacts.

› Review Questions

Multiple-Choice Questions

1. Deserts cover roughly what percentage of the the Earth's land surface?

   (A) 10%
   (B) 20%
   (C) 30%
   (D) 40%
   (E) 50%

2. When formerly fertile land is degraded, there is

   (A) loss of biodiversity
   (B) an increase in water
   (C) a gain in economic yield
   (D) species diversification
   (E) a drop in fungal growth

3. Deforestation, overgrazing, and bad irrigation practices all contribute to

   (A) juvenile delinquency
   (B) glacier formation
   (C) desertification
   (D) wetlands formation
   (E) sedimentation

4. In size, the Great Basin Desert of the United States is only about one-third the size of the (see Table 13.1)

   (A) Kalahari Desert
   (B) Gobi Desert
   (C) Chihuahuan
   (D) Sahara
   (E) Patagonia

5. Forests are mainly divided into temperate and

   (A) dry regions
   (B) wetland regions
   (C) arctic regions
   (D) tropical regions
   (E) desert regions

6. Old-growth coastal redwoods live to be as much as

   (A) 300 years old
   (B) 750 years old
   (C) 1,000 years old
   (D) 1,500 years old
   (E) 2,000 years old

7. The following factors can all increase desertification except

   (A) wind
   (B) total rainfall
   (C) forest management
   (D) temperature
   (E) location

8. Second- and third-growth forests contain

   (A) many more plant and animal species
   (B) trees of the same age and size
   (C) mainly conifers
   (D) larger trees than those in old-growth forests
   (E) only broad-leafed trees

9. The European white elm tree in western Siberia is known as a

   (A) new species
   (B) nonnative species
   (C) relict species
   (D) primary species
   (E) replanted species

10. Which is important for some biological species to reproduce and clear undergrowth for new sprouts?

    (A) Lime
    (B) Fire
    (C) Iron oxide
    (D) Ice
    (E) Wind

11. Remote sensing is an important tool in the study of dynamic desert features like

    (A) tree growth
    (B) camel populations
    (C) flash floods
    (D) dunes
    (E) locust species

12. A tropical rain forest, found near the equator, has

    (A) primarily conifers
    (B) few native species
    (C) increasing fungal growth
    (D) the richest diversity of terrestrial plants and animals
    (E) no new species to be observed by scientists

13. In developing countries, the need for which major resource will double in the next 25 years?

(A) Fuel wood and charcoal
(B) Soybeans
(C) Milk
(D) Television
(E) Latex

14. What percentage of all the forests on the Earth has been converted to cropland?

(A) 10%
(B) 20%
(C) 30%
(D) 40%
(E) 50%

15. Deserts are distinguished by all the following factors except

(A) number of days of rainfall
(B) wind
(C) temperature
(D) oases
(E) lightning strikes

16. When plant cover is removed by clear-cutting, other local populations (mammals, birds, and insects)

(A) increase
(B) are not affected
(C) are greatly affected
(D) remain in the area
(E) resist disease

17. When topsoil is blown or washed away, what happens to the remaining land?

(A) Its biochemical makeup is changed.
(B) Its nutrients are maintained.
(C) Its structure is unchanged.
(D) It becomes a major conservation factor.
(E) Its water content increases.

18. What extremely long-lived tree species is resistant to insects and fire?

(A) Hickory
(B) Spruce
(C) Redwood
(D) Aspen
(E) Oak

19. Rotational grazing involves all the following ranching and herding activities except

(A) confining herds to a small area
(B) herds fertilizing heavily
(C) herds trampling woody plants and weeds
(D) long-term grazing of herds over a large area
(E) herds eating everything in the area

› Answers and Explanations

1. **C**
2. **A**—As species are killed or forced to move, the diversity of an area declines.
3. **C**—The soil loses its nutrients and is less likely to support many species.
4. **B**
5. **D**—Tropical forests grow well in hot and humid equatorial regions.
6. **E**—Scientists have found them to contain compounds resistant to insects.
7. **C**—Forest management decreases desertification.
8. **B**—These have far fewer plant and animal species than do old-growth forests.
9. **C**—Relict species outlive other species but often lose much original habitat.
10. **B**—Fire contributes organic mass to soil and exposes the ground to more light.
11. **D**—Remote sensing is needed for the "big picture" of dune growth and travel.
12. **D**—High rainfall and warm temperatures allow many different species to thrive.
13. **A**—Fuel wood and charcoal are used for basics such as cooking and heating.
14. **E**
15. **E**—Since they have few storms and rain, they have few lightning strikes.
16. **C**—Clear-cutting destroys not only forests but also their dependent species' habitat.
17. **A**—Surface cracks appear, nutrients are lost, and excess water may increase salts.
18. **C**
19. **D**—Rotational grazing involves short-term grazing over a small area.

Free-Response Questions

1. Wildlife conservationists want a ban on cattle grazing to stop the threat to endangered species in the southwestern United States. Although grazing fees are charged to ranchers for using federal lands, they are quite low and serve as a subsidy to ranchers who pay much more to lease private land. Roughly 31,000 permits are issued annually for federal rangeland use and bring in around $11 million. However, administration and maintenance of those same lands costs taxpayers $47 million. This fiscal discrepancy serves as a wake-up call to rangeland management and public policy makers. Defending western culture and history, ranchers also avoid subdivision of the West by developers, along with the resulting environment and wildlife impacts.
   (a) In what ways does grazing benefit grassland biomes?
   (b) Describe major environmental and socioeconomic consequences of overgrazing.
   (c) Define desertification.
   (d) Name five causes of desertification.

2. It has been estimated that over 50% of all the forests on the Earth have been converted to cropland. Most countries cut down more trees than they replant, but some are starting huge reforestation programs.
   (a) Explain why reforestation often increases damage from forest diseases.
   (b) Explain why governmental management of forests is controversial.

Free-Response Answers and Explanations

1.
   a. Managed properly, grazing can increase wildlife diversity and the overall health of grasslands. When herds are allowed to graze rotationally for short amounts of time, they eat everything, not just the tender shoots; trample woody plants and weeds; and fertilize heavily before moving to greener pastures. This keeps the land healthy and supports native forage species. It also promotes areas of varied growth height, which support a variety of habitats and niches for diverse wildlife to fill.
   b. Overgrazing is one of the major reasons for desertification. By reducing the land's ability to support life, desertification negatively affects wild and domestic animals, plant life, and people. Because it causes soil erosion while also affecting the ability of the soil to soak up water, the water loss drives away or kills local flora and fauna. Socioeconomic consequences for humans also result from desertification brought on by overgrazing. Whole human populations must move from land unable to sustain their animals and crops or provide water. The rippling effects from overgrazing can be seen from habitat destruction to war since people will fight for fertile land and crop resources.
   c. Desertification is the downgrading of rich soil and land into dry barren lands.
   d. Deforestation, overgrazing, rain runoff, changing wind patterns driving away rain clouds, and bad irrigation practices.
2.
   a. Many reforestation plantings are done with a single tree species. When this happens, the forest becomes much more vulnerable to disease than when it had a wide variety of tree species resistant to different diseases.
   b. Governments must juggle the different needs of lumber companies, ecologists, landowners, developers, fishermen, and the public.

Rapid Review

- When a forested area is cut down completely, it is known as clear-cutting.
- Old-growth forests are those that have never been harvested, with trees between 200 and 2,000 years old.
- Forest floor leaf litter and fallen logs provide habitat for interdependent animals, birds, amphibians, insects, bacteria, and fungi adapted to each other over geological time.
- When the forests are cleared, plants, animals, birds, and insects are displaced or destroyed, causing a loss of biodiversity and often extinction.
- Forests are mainly divided into temperate (moderate climate) or tropical regions.
- Temperate forests are grouped into conifers (needle-leaf trees) like pine, spruce, redwood, cedar, fir, sequoia, and hemlock, while tropical forests contain flat-leaf trees.
- Old-growth forests contain mostly conifers.
- Second- and third-growth forests contain trees of the same age and size as some of the younger old-growth trees, but have far fewer plant and animal species.
- Land overuse can come from economic circumstances, poor land laws, or cultural customs.
- Some biological species need fire to clear undergrowth, allowing these species to reproduce, and new sprouts to survive.
- When topsoil is blown or washed away, the remaining land's physical structure and biochemical makeup are changed.

- Population decrease can cause desertification, since there are fewer people to take care of the land.
- Desertification is the downgrading of rich soil and land into dry, barren lands.
- An economy based on crop sales can cause farmers to ignore the overexploitation of the land.
- A temperate rain forest is found in only a few special places around the world, such as the Pacific temperate rain forest on the west coast of North America.
- Intense, rotational grazing like that done by wild herds (e.g., buffalo, zebras) is often better for the land than long-term grazing.
- Wild species are often more pest resistant, disease resistant, and drought tolerant, and can fend off predators better than domestic cattle, goats, or sheep.
- Elk, American bison, and various African species need less care and feeding than cattle or sheep, while bringing a better market price.